FIG. 1

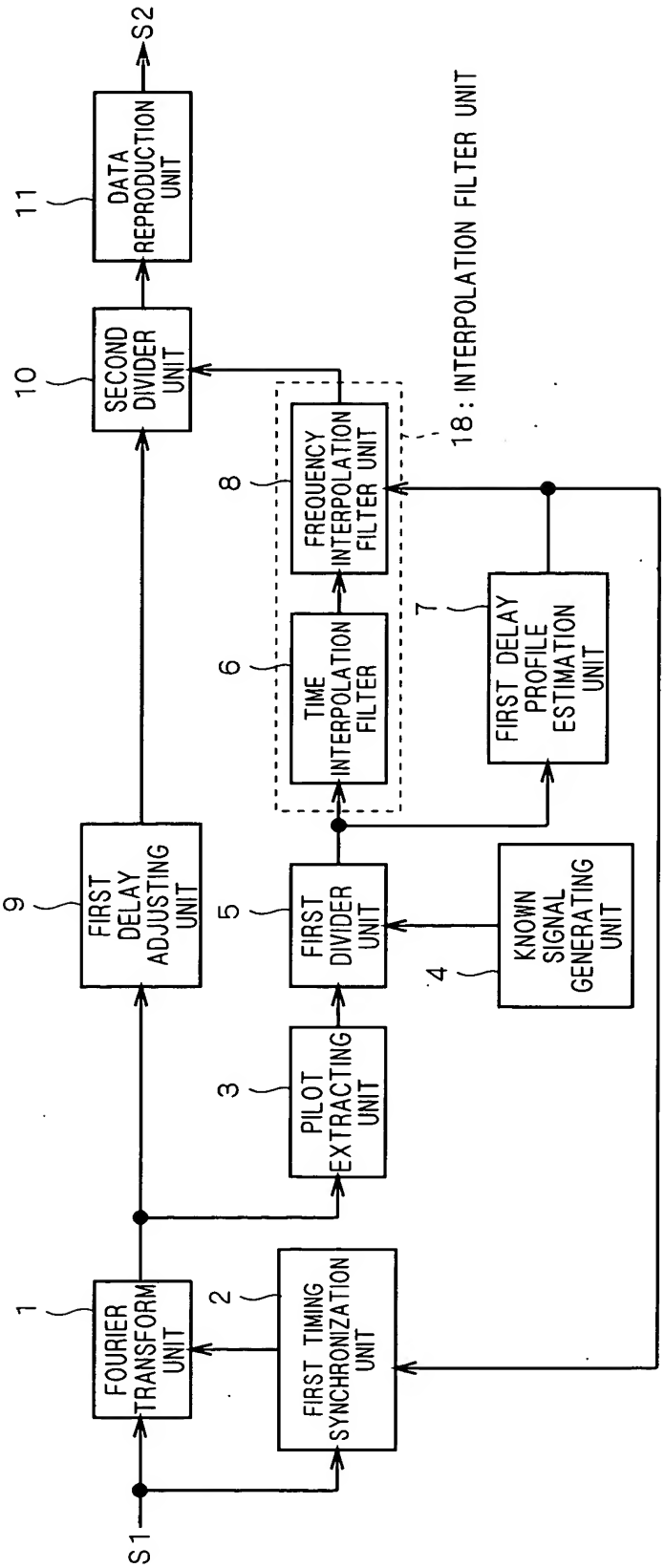

S1
S2
1
FOURIER TRANSFORM UNIT
2
FIRST TIMING SYNCHRONIZATION UNIT
3
PILOT EXTRACTING UNIT
4
KNOWN SIGNAL GENERATING UNIT
5
FIRST DIVIDER UNIT
6
TIME INTERPOLATION FILTER
7
FIRST DELAY PROFILE ESTIMATION UNIT
8
FREQUENCY INTERPOLATION FILTER UNIT
9
FIRST DELAY ADJUSTING UNIT
10
SECOND DIVIDER UNIT
11
DATA REPRODUCTION UNIT
18 : INTERPOLATION FILTER UNIT

FIG. 2

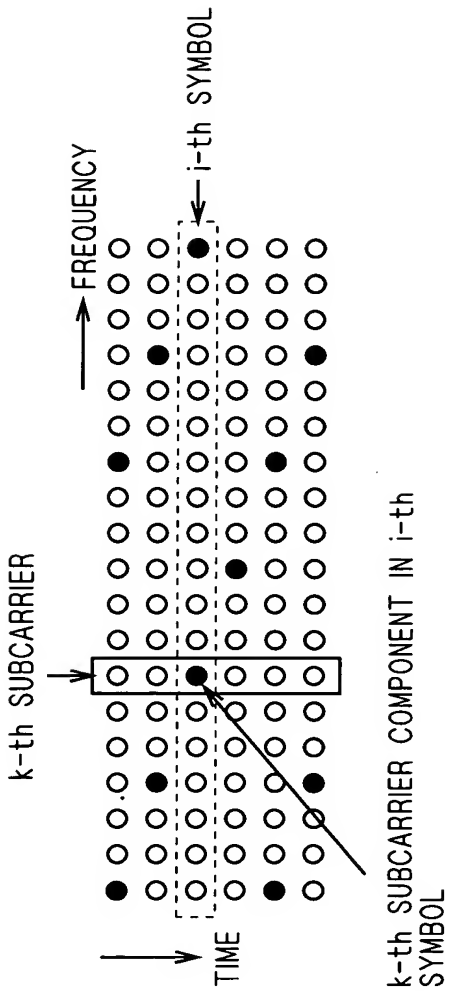

FREQUENCY
i-th SYMBOL
k-th SUBCARRIER
TIME
k-th SUBCARRIER COMPONENT IN i-th SYMBOL

FIG. 3

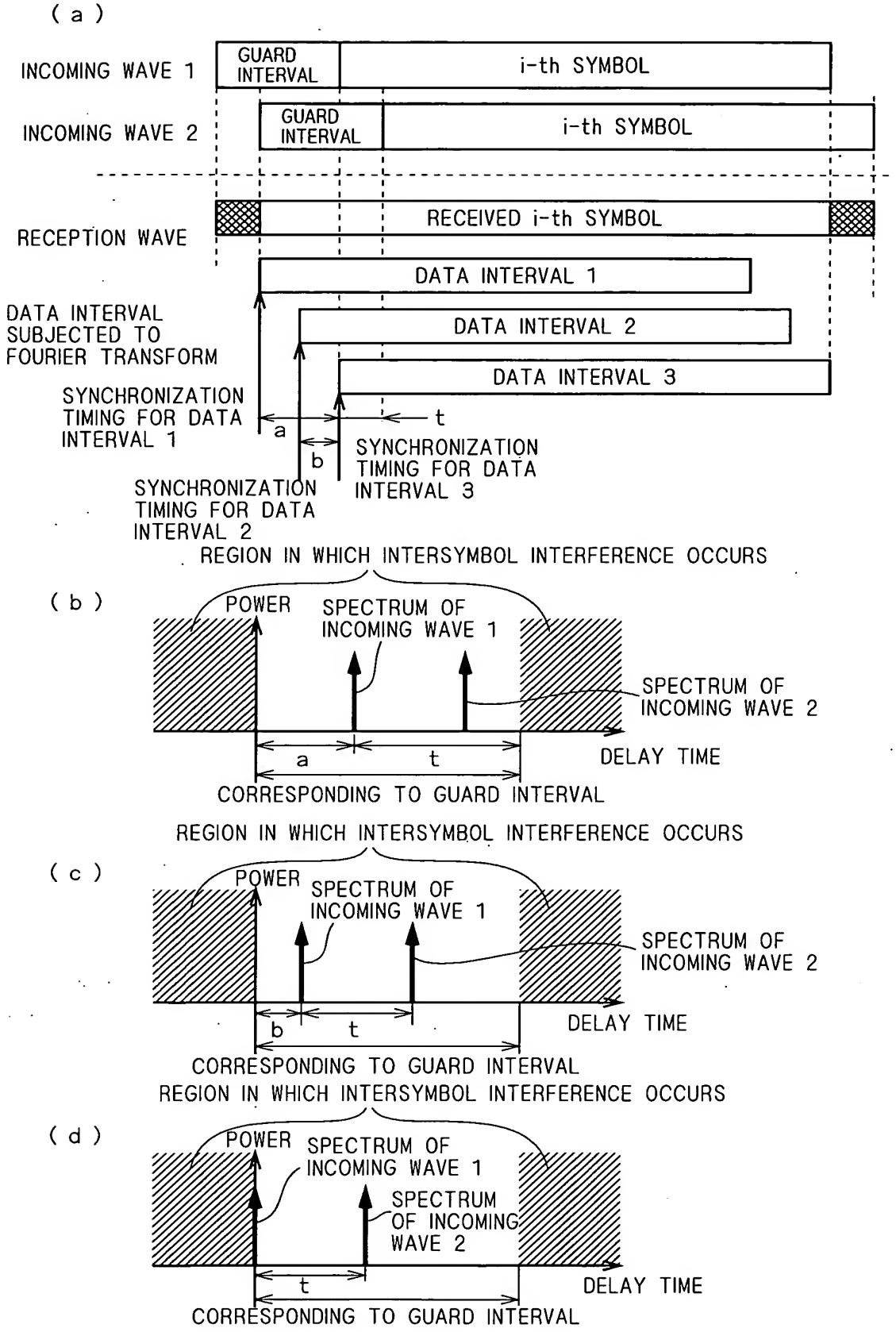

(a)
INCOMING WAVE 1
GUARD INTERVAL
i-th SYMBOL
INCOMING WAVE 2
GUARD INTERVAL
i-th SYMBOL
RECEPTION WAVE
RECEIVED i-th SYMBOL
DATA INTERVAL 1
DATA INTERVAL 2
DATA INTERVAL 3
DATA INTERVAL SUBJECTED TO FOURIER TRANSFORM
SYNCHRONIZATION TIMING FOR DATA INTERVAL 1
SYNCHRONIZATION TIMING FOR DATA INTERVAL 2
SYNCHRONIZATION TIMING FOR DATA INTERVAL 3
a
b
t
REGION IN WHICH INTERSYMBOL INTERFERENCE OCCURS
(b)
POWER
SPECTRUM OF INCOMING WAVE 1
SPECTRUM OF INCOMING WAVE 2
DELAY TIME
a
t
CORRESPONDING TO GUARD INTERVAL
REGION IN WHICH INTERSYMBOL INTERFERENCE OCCURS
(c)
POWER
SPECTRUM OF INCOMING WAVE 1
SPECTRUM OF INCOMING WAVE 2
DELAY TIME
b
t
CORRESPONDING TO GUARD INTERVAL
REGION IN WHICH INTERSYMBOL INTERFERENCE OCCURS
(d)
POWER
SPECTRUM OF INCOMING WAVE 1
SPECTRUM OF INCOMING WAVE 2
DELAY TIME
t
CORRESPONDING TO GUARD INTERVAL

FIG. 4

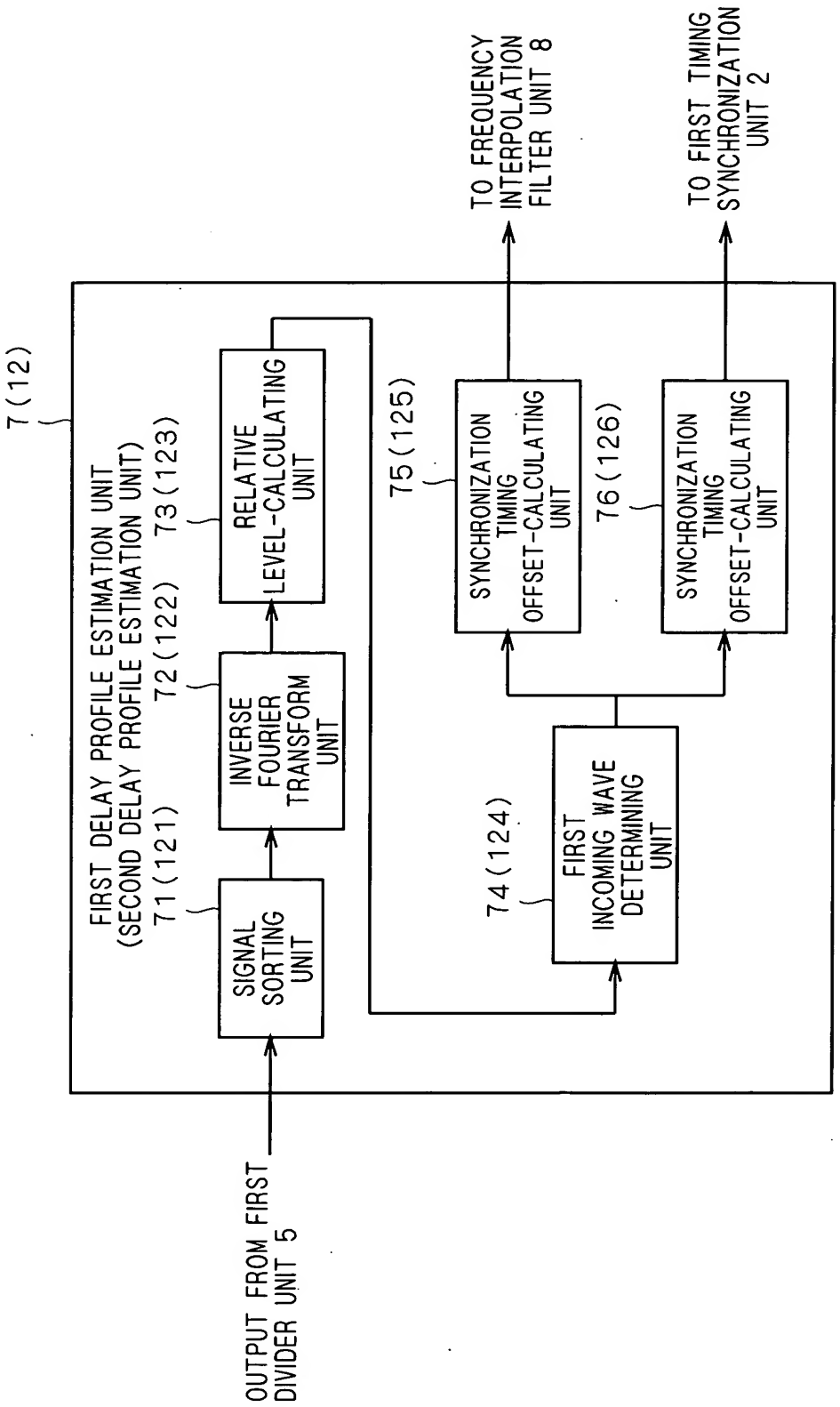

7(12)
FIRST DELAY PROFILE ESTIMATION UNIT
(SECOND DELAY PROFILE ESTIMATION UNIT)
71(121)
SIGNAL SORTING UNIT
72(122)
INVERSE FOURIER TRANSFORM UNIT
73(123)
RELATIVE LEVEL-CALCULATING UNIT
74(124)
FIRST INCOMING WAVE DETERMINING UNIT
75(125)
SYNCHRONIZATION TIMING OFFSET-CALCULATING UNIT
76(126)
SYNCHRONIZATION TIMING OFFSET-CALCULATING UNIT
OUTPUT FROM FIRST DIVIDER UNIT 5
TO FREQUENCY INTERPOLATION FILTER UNIT 8
TO FIRST TIMING SYNCHRONIZATION UNIT 2

FIG. 5

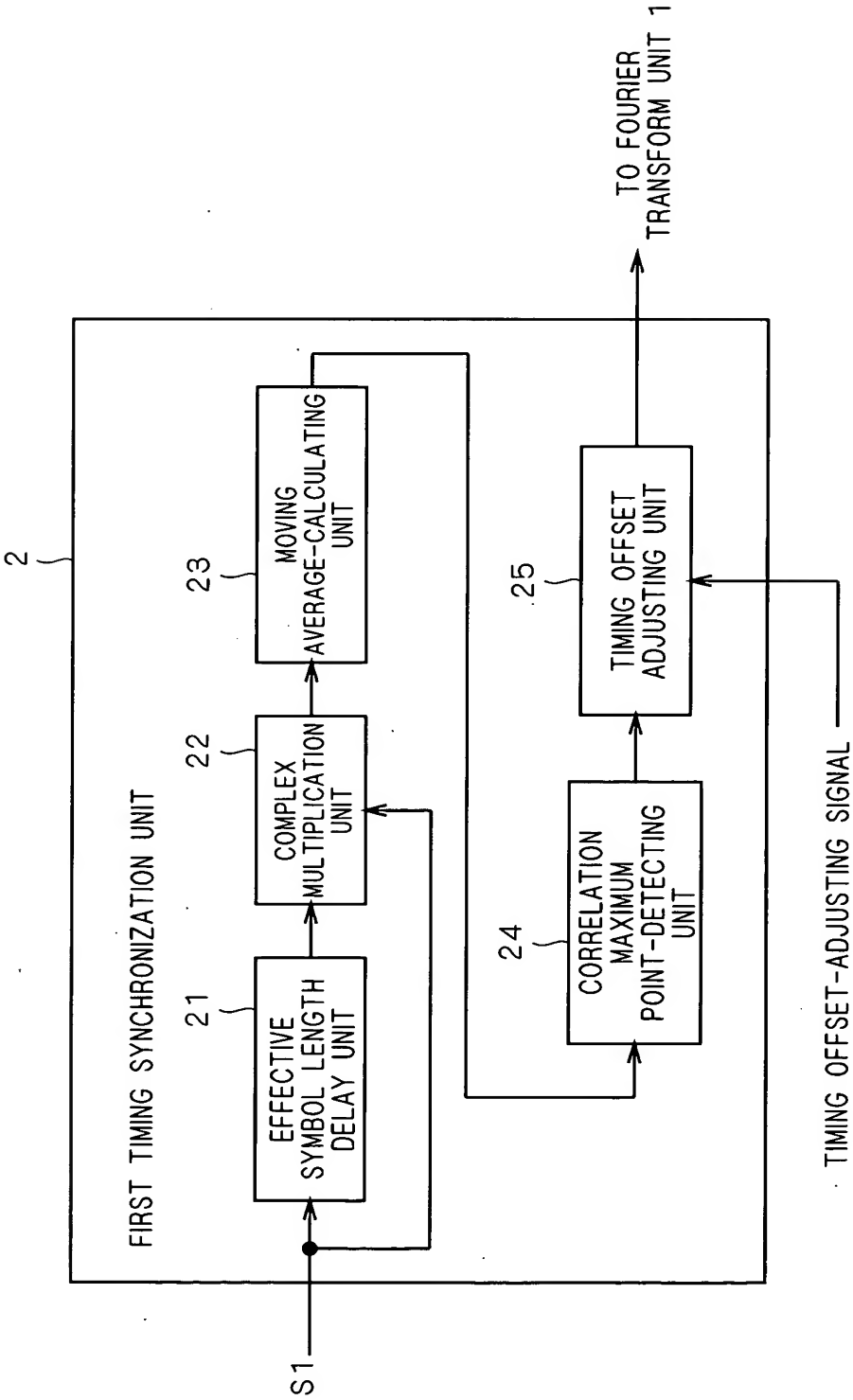

TO FOURIER TRANSFORM UNIT 1
2
FIRST TIMING SYNCHRONIZATION UNIT
23
MOVING AVERAGE-CALCULATING UNIT
22
COMPLEX MULTIPLICATION UNIT
21
EFFECTIVE SYMBOL LENGTH DELAY UNIT
25
TIMING OFFSET ADJUSTING UNIT
24
CORRELATION MAXIMUM POINT-DETECTING UNIT
S1
TIMING OFFSET-ADJUSTING SIGNAL

FIG. 6

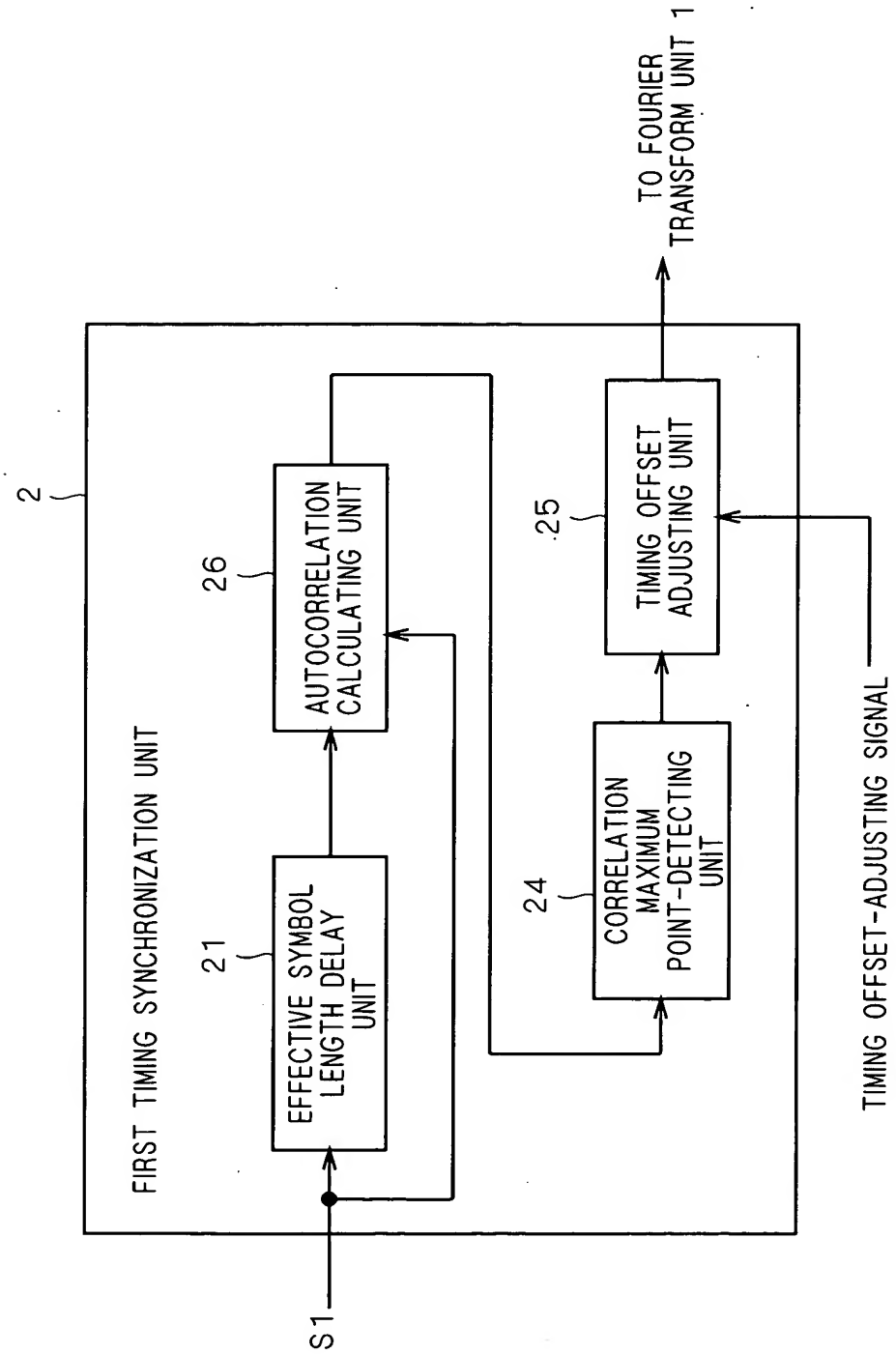

FIRST TIMING SYNCHRONIZATION UNIT
2
EFFECTIVE SYMBOL LENGTH DELAY UNIT
21
AUTOCORRELATION CALCULATING UNIT
26
CORRELATION MAXIMUM POINT-DETECTING UNIT
24
TIMING OFFSET ADJUSTING UNIT
25
S1
TO FOURIER TRANSFORM UNIT 1
TIMING OFFSET-ADJUSTING SIGNAL

FIG. 7

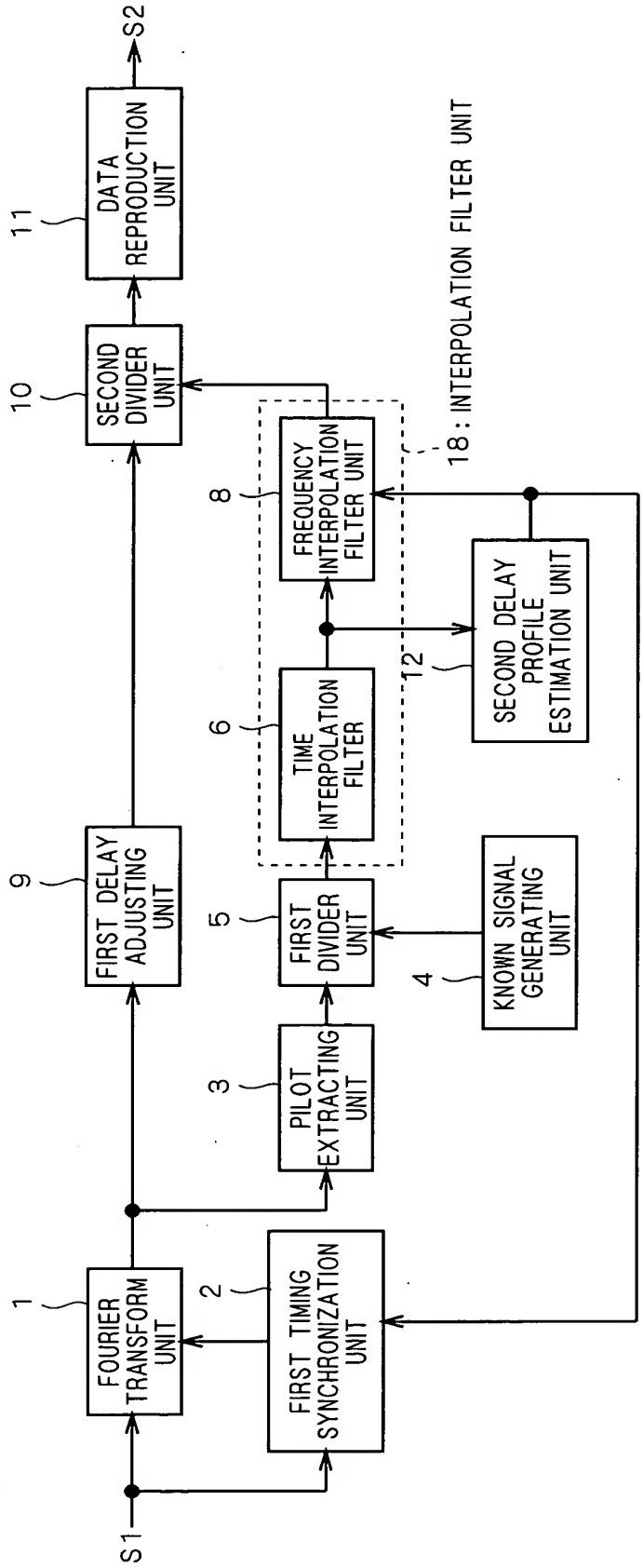

S1
S2
1
FOURIER TRANSFORM UNIT
2
FIRST TIMING SYNCHRONIZATION UNIT
3
PILOT EXTRACTING UNIT
4
KNOWN SIGNAL GENERATING UNIT
5
FIRST DIVIDER UNIT
6
TIME INTERPOLATION FILTER
8
FREQUENCY INTERPOLATION FILTER UNIT
9
FIRST DELAY ADJUSTING UNIT
10
SECOND DIVIDER UNIT
11
DATA REPRODUCTION UNIT
12
SECOND DELAY PROFILE ESTIMATION UNIT
18: INTERPOLATION FILTER UNIT

FIG. 8

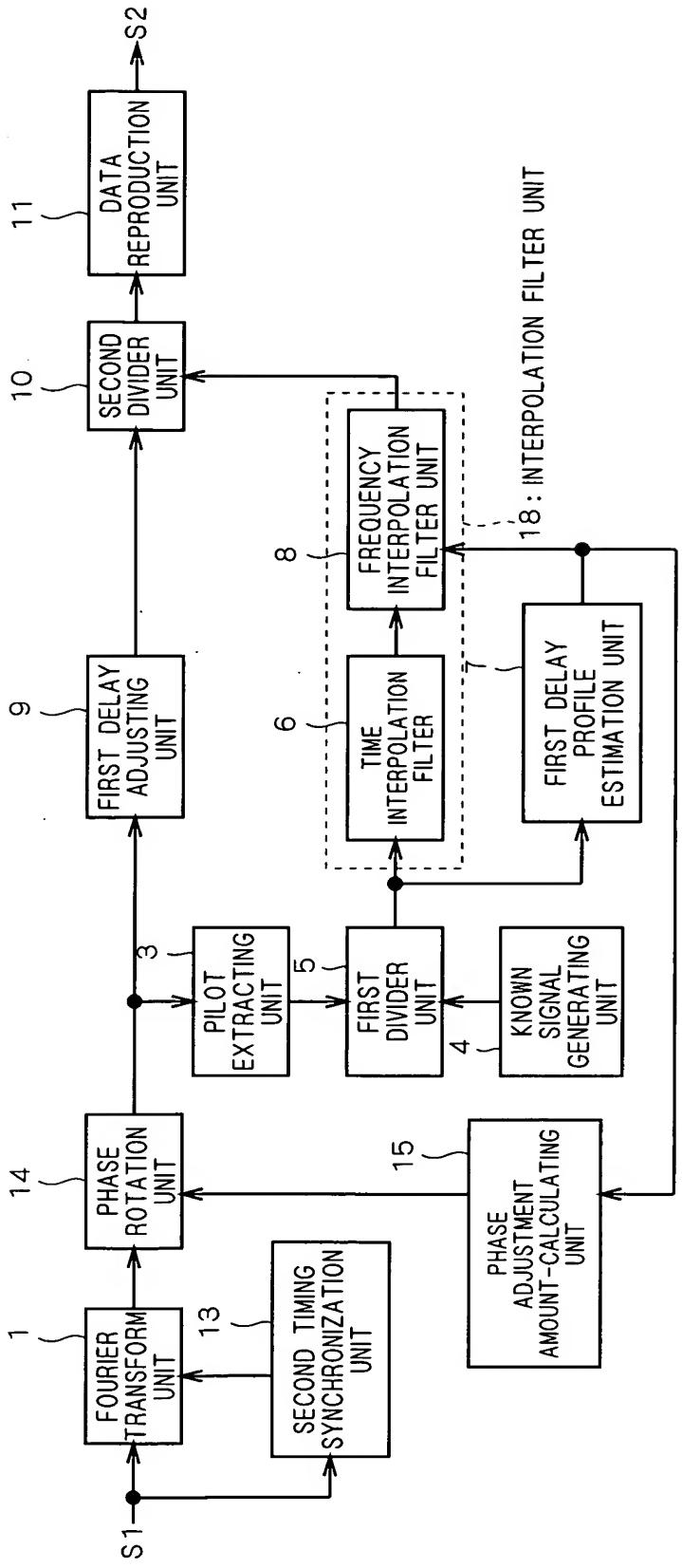
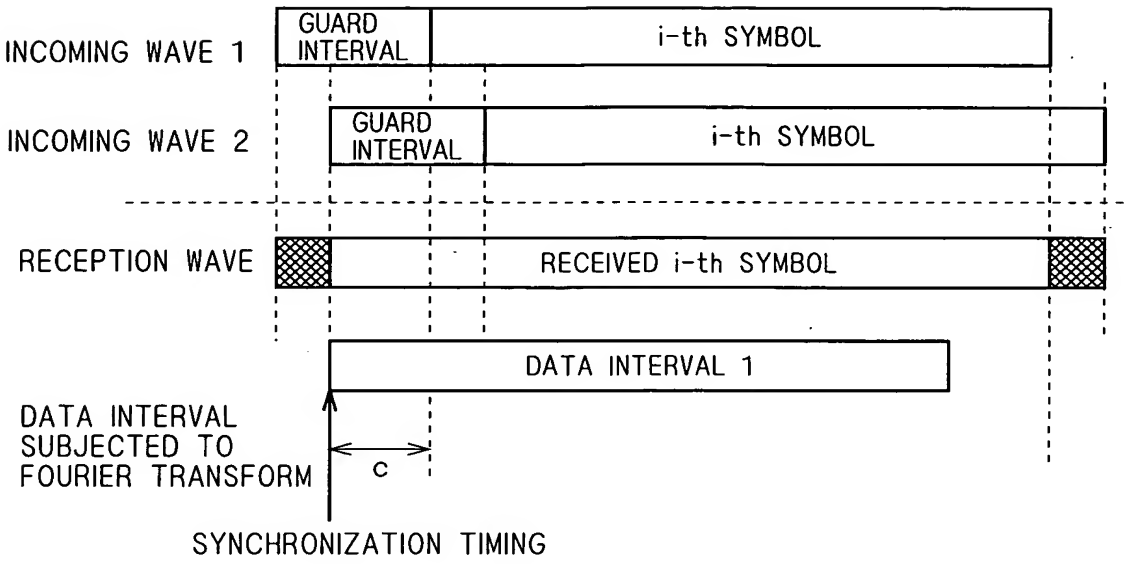
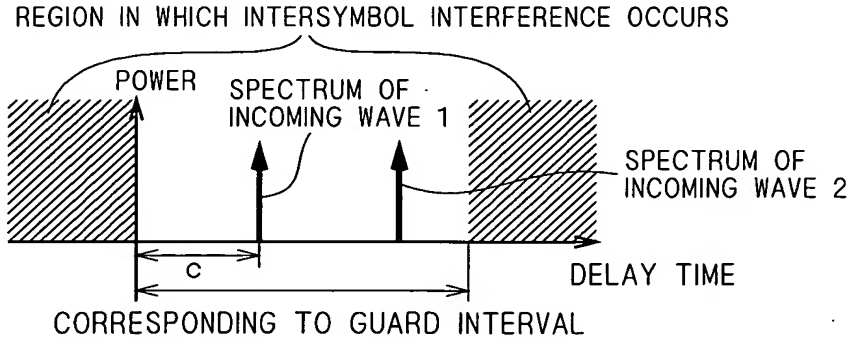

S1
S2
1
FOURIER TRANSFORM UNIT
13
SECOND TIMING SYNCHRONIZATION UNIT
14
PHASE ROTATION UNIT
15
PHASE ADJUSTMENT AMOUNT-CALCULATING UNIT
9
FIRST DELAY ADJUSTING UNIT
10
SECOND DIVIDER UNIT
11
DATA REPRODUCTION UNIT
3
PILOT EXTRACTING UNIT
5
FIRST DIVIDER UNIT
4
KNOWN SIGNAL GENERATING UNIT
6
TIME INTERPOLATION FILTER
8
FREQUENCY INTERPOLATION FILTER UNIT
7
FIRST DELAY PROFILE ESTIMATION UNIT
18: INTERPOLATION FILTER UNIT

FIG. 9

(a)


INCOMING WAVE 1
GUARD INTERVAL
i-th SYMBOL
INCOMING WAVE 2
GUARD INTERVAL
i-th SYMBOL
RECEPTION WAVE
RECEIVED i-th SYMBOL
DATA INTERVAL 1
DATA INTERVAL SUBJECTED TO FOURIER TRANSFORM
c
SYNCHRONIZATION TIMING

(b)


REGION IN WHICH INTERSYMBOL INTERFERENCE OCCURS
POWER
SPECTRUM OF INCOMING WAVE 1
SPECTRUM OF INCOMING WAVE 2
c
DELAY TIME
CORRESPONDING TO GUARD INTERVAL

(c)

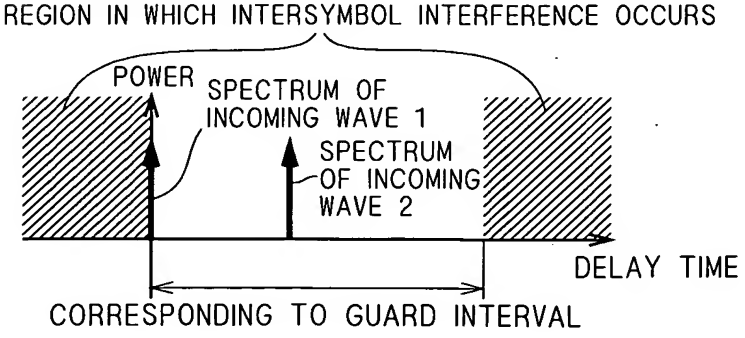

REGION IN WHICH INTERSYMBOL INTERFERENCE OCCURS
POWER
SPECTRUM OF INCOMING WAVE 1
SPECTRUM OF INCOMING WAVE 2
DELAY TIME
CORRESPONDING TO GUARD INTERVAL

FIG. 10

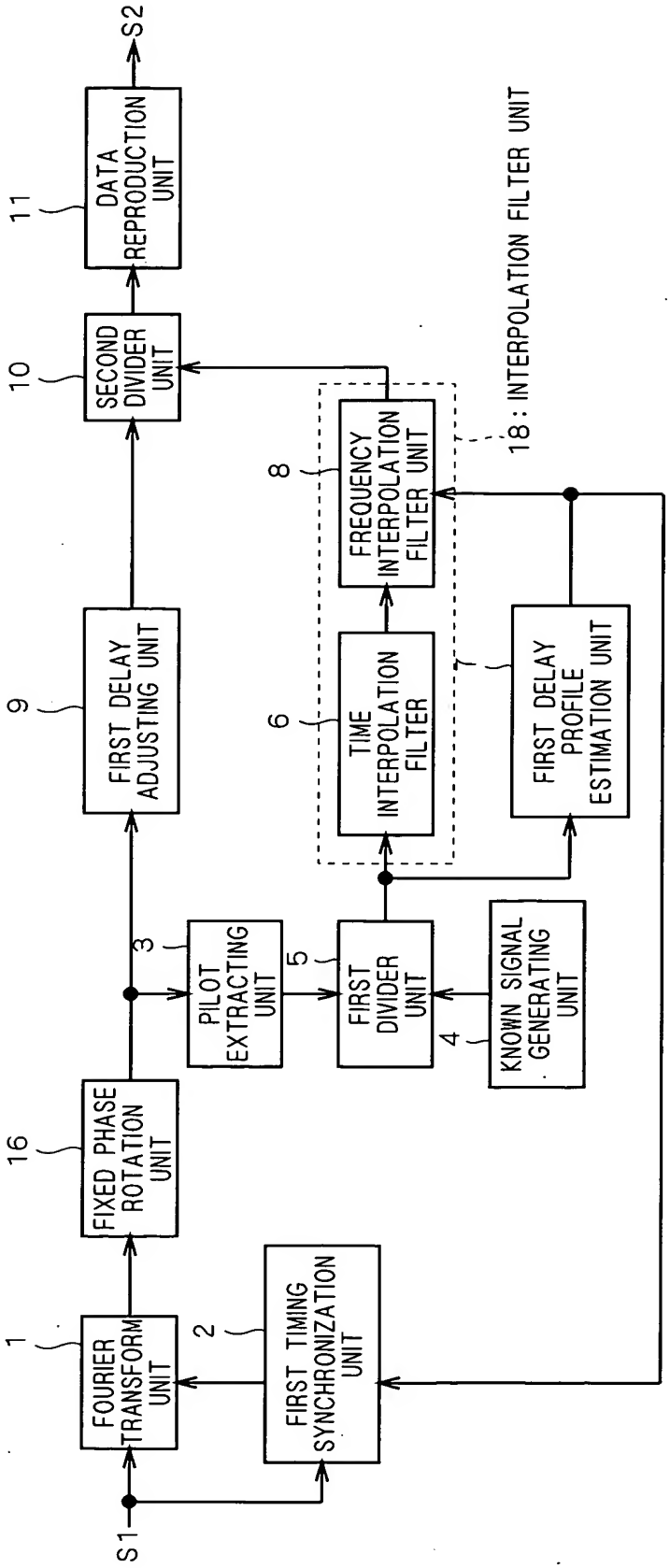

S1
S2
1
FOURIER TRANSFORM UNIT
2
FIRST TIMING SYNCHRONIZATION UNIT
3
PILOT EXTRACTING UNIT
4
KNOWN SIGNAL GENERATING UNIT
5
FIRST DIVIDER UNIT
6
TIME INTERPOLATION FILTER
7
FIRST DELAY PROFILE ESTIMATION UNIT
8
FREQUENCY INTERPOLATION FILTER UNIT
9
FIRST DELAY ADJUSTING UNIT
10
SECOND DIVIDER UNIT
11
DATA REPRODUCTION UNIT
16
FIXED PHASE ROTATION UNIT
18: INTERPOLATION FILTER UNIT

FIG. 11

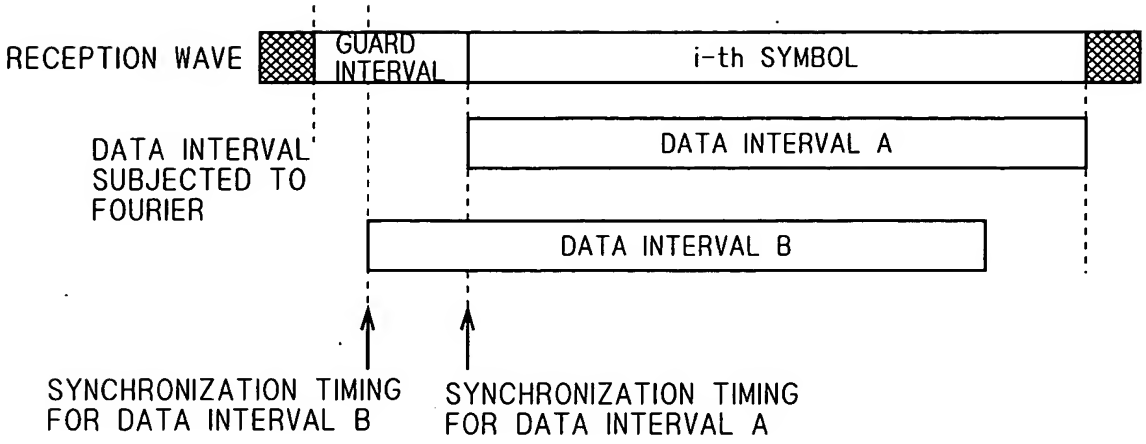
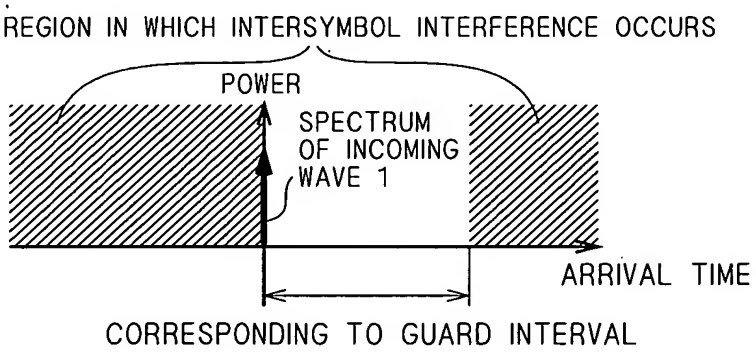
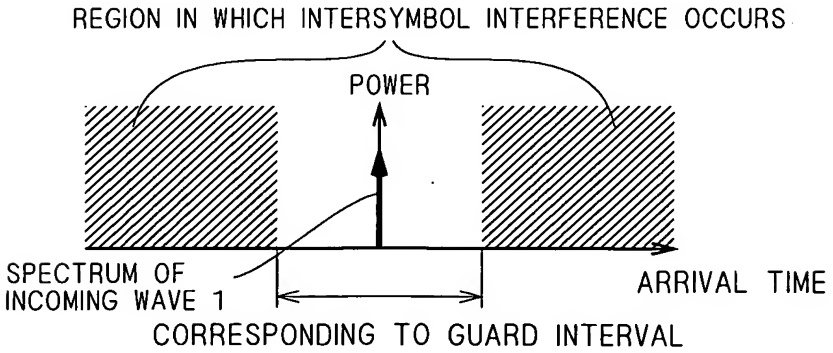


FIG. 12

(A) THE INTERSYMBOL INTERFERENCE OCCURRENCE REGION OF FIRST PREFERRED EMBODIMENT



(B) THE INTERSYMBOL INTERFERENCE OCCURRENCE REGION OF FOURTH PREFERRED EMBODIMENT